

## CLAIMS:

1. A process for the production of an ether optionally with a diol and/or a lactone, by reaction of a corresponding organic feed material selected from unsaturated dicarboxylic acids and/or anhydrides, mono-esters of unsaturated dicarboxylic acids and/or anhydrides, diesters of unsaturated dicarboxylic acids and/or anhydrides, unsaturated lactones, and mixtures of two or more thereof in the presence of hydrogen which comprises the steps of:
  - (a) supplying a stream comprising at least a portion of the organic feed material to a pre-reactor zone comprising catalyst and operating under reaction conditions and contacting said feed with a hydrogen containing stream such that at least some of the carbon carbon double bonds are saturated;
  - (b) vaporising the at least partly saturated feed into the hydrogen containing stream in a vaporising zone;
  - (c) supplying the hydrogen-containing stream containing the vaporised at least partially saturated feed to a reaction zone comprising catalyst and operating under reaction conditions;
  - (d) recovering from the reaction zone a product stream comprising the ether and optionally diol and/or lactone; and
  - (e) recycling depleted hydrogen-containing stream to at least the pre-reactor zone or the vaporisation zone.
2. A process according to Claim 1 wherein the at least partly saturated feed is vaporised by and into the hydrogen in step (b).
3. A process according to Claim 1 or 2 wherein the pre-reactor zone and vaporisation zone are separate zones within the same vessel.
4. A process according to Claim 1 or 2 wherein the pre-reactor zone and vaporisation zone are commingled.

5. A process according to Claim 4 wherein the catalyst in the pre-reactor zone provides contact area on which vaporisation occurs.
6. A process according to Claim 1 or 2 wherein the pre-reactor zone and the vaporisation zone are located in separate vessels such that the at least partially saturated feed from the pre-reactor zone is passed to the vaporisation zone.
7. A process according to any one of Claims 1 to 6 wherein additional unsaturated organic feed material is vaporised into the hydrogen-containing stream in the vaporisation zone.
8. A process according to Claim 7 wherein the additional unsaturated organic feed material is vaporised by the hydrogen containing stream.
9. A process according to any one of Claims 1 to 8 wherein additional unsaturated organic feed material is supplied to the reaction zone in step (c)
10. A process according to Claim 9 wherein the additional unsaturated organic feed material is vaporised into a second hydrogen-containing stream before being supplied to the reaction zone in step (c)
11. A process according to Claim 10 wherein the additional unsaturated organic feed material is vaporised by the second hydrogen containing stream.
12. A process according to any one of Claims 1 to 11 wherein unreacted feed material and by-products, which may optionally include the diol and/or lactone are recycled and are vaporised into a hydrogen-containing stream in a vaporisation zone.
13. A process according to Claim 12 wherein the recycled stream is vaporised by the hydrogen containing stream.

14. A process according to any one of Claims 1 to 13 wherein unreacted feed material and by-products, which may optionally include the diol and/or lactone are recycled and are vaporised into a second hydrogen-containing stream before being supplied to the reaction zone in step (c).
15. A process according to Claim 14 wherein the recycled stream is vaporised by the second hydrogen containing stream.
16. A process according to any one of Claims 1 to 15 wherein the feed material is contained within an organic solvent which is separated from the feed material in either the vaporisation zone or in a separate stripping column by cycle gas stripping.
17. A process according to any one of Claims 1 to 16 wherein the at least partial carbon double bond saturation occurs in the liquid phase in the pre-reaction zone.
18. A process according to any one of Claims 1 to 17 wherein the organic feed material is selected from mono  $C_1$  to  $C_4$  alkyl esters of  $C_4$  to  $C_{12}$  unsaturated dicarboxylic acids and/or anhydrides, di- $(C_1$  to  $C_4)$  alkyl esters of  $C_4$  to  $C_{12}$  unsaturated dicarboxylic acids and/or anhydrides, lactones of  $C_4$  to  $C_{12}$  unsaturated hydroxycarboxylic acids, and mixtures of two or more thereof.
19. A process according to Claim 18 wherein the organic feed material is selected from monomethyl maleate, monomethyl fumarate, dimethyl maleate, dimethyl fumarate, monoethyl maleate, monoethyl fumarate, diethyl maleate, diethyl fumarate and mixtures of two or more thereof.
20. A process according to any one of Claims 1 to 17 wherein the feed is one or more unsaturated acids and/or anhydrides and the process includes an esterification step.

21. A process according to Claim 20 wherein the esterification step is carried out in an esterification zone.
22. A process according to Claim 21 wherein the esterification zone is located before or after the pre-reactor zone.
23. A process according to any one of Claims 1 to 23 wherein the ether is tetrahydrofuran.